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### (54) LOOSENING-PROOF SCREW.

(57) A loosening-proof screw in which a female screw (2) of a synthetic resin and a male screw (1) of a metal, or a female screw (2) of a synthetic resin and a male screw (1) of a synthetic resin are engaged with each other. The female screw (2) has around its axis a double cylinder type boss portion. The male screw (1) is so formed that it can be engaged with an inner boss (7). In a final stage of the tightening of the screw, the terminal end of the inner boss (7) is pressed by a material to be fixed (3) or a flanged portion of the male screw. Consequently, a threaded portion (5) of the inner boss (7) is deformed slightly due to the elasticity of the synthetic resin of the female screw (2) to press the male screw (1) at right angles to the axis thereof.

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DESCRIPTION

## Screw Equipped with Locking Means

## BACKGROUND OF THE INVENTION

This invention relates to a screw equipped with a locking means, more particularly to a screw equipped with a locking means which not only can prevent the screw from being loosened by, for example, vibration or shock, but also will enable a shortening of the assembly steps by obviating such work as the insertion of a packing or spring washer, or the injection of an adhesive for the prevention of looseness, simultaneously with realizing a saving of the parts to be used.

A conventional screw, as can be seen from the sectional view shown in Fig. 1 (A), has a means for preventing looseness which clamps a member to be fixed, for example, a plate 3, with a bolt 1 and a nut 2 with a packing or spring washer 4 interposed therebetween. Also, as a means of enabling a more complete fixing, an adhesive has been injected at the fitting portion 5 between the bolt 1 and the nut 2 (the sectional view shown in Fig. 1 (B) shows an example of an anchor bolt).

However, according to such a prior art method, a separate material such as a spring washer or adhesive is required and the step of mounting the spring washer 4 or injecting adhesive is required. Further, the adhesive force of the adhesive will be inevitably lowered by change over a period of time. When the screw is to be repeatedly detached, it is impossible to use an adhesive and further, the function of the spring washer 4 will be inevitably degraded, or abrasion will occur after repeated use. Such problems will occur more markedly when the material of the screw consists of different substances.

## SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a screw equipped with a locking means which

prevents looseness of the screw as mentioned above and also obviates the use of a spring washer or an adhesive.

More specifically, in accordance with the present invention, there is provided a screw equipped with a locking means, comprising a female thread made of a synthetic resin and a male thread made of a metal, or a female thread made of a synthetic resin and a male thread made of a synthetic resin, fitted with each other, the female thread having a double cylindrical boss portion formed at the center thereof so that the male thread may be fitted into the innerside boss portion and the thread portion of the boss may be deformed more or less and pressed against the shaft of the male thread in the direction perpendicular thereto through the resilience of the synthetic resin, which is the material of the female thread, by pressure on the terminal end of the innerside boss portion from the flange portion of the male thread or a member to be fixed at the final stage of clamping the screw.

#### EXPLANATION OF THE DRAWINGS

The present invention is described in detail below with reference to the drawings, in which:

Figures 1 (A) and (B) are sectional views showing the screw of the prior art, as described above; and,

Figures 2 (A) and (B) and Figures 3 (A) and (B) are sectional views showing embodiments of the present invention, in which Figs. 2 (A) and (B) show the screw constitution of a through-type nut and bolt, and Figs. 3 (A) and (B) the screw constitution of an anchor-type bolt and nut.

#### DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

First, an embodiment 1 of the screw equipped with a locking means according to the present invention is described with reference to Figs. 2 (A) and (B).

Figure 2 (A) shows a screw consisting of a male thread 1 made of a metal or a synthetic resin (hereinafter called "bolt"), a female thread 2 made of a synthetic resin (hereinafter called "nut") fitted therewith, and a member 3 to be fixed.

The nut 2 has a double cylindrical boss portion 7 having a thread fitting portion 5 at the center, and a groove 6 is provided between the boss portion and the nut body.

Figure 2 (B) shows details of the nut, the constitution of which is such that the thickness  $L_2$  between the screw ends of the end portions 8 of the double cylindrical boss and the thickness  $L_1$  between the screw ends of the end faces 8' of the nut body may have the relationship  $L_2 > L_1$ .

When a screw having such a constitution is used, at the final stage of clamping the screw, first the end face 8 comes into contact with the member to be fixed 3 and, as clamping is further continued, the double cylindrical boss portion 7 is pressed as a whole by the member to be fixed, and is deformed by expansion toward the groove 6 side and the thread fitting portion 5 side to finally clamp the nut 1 and the member 3 to be fixed, thus functioning to prevent a loosening of the screw through resilience of the synthetic resin.

Next, another embodiment 2 of the screw equipped with a locking means according to the present invention is described with reference to Figs. 3 (A) and (B).

Figure 3 (A) shows an anchor-type screw consisting of a bolt 1 made of a metal or a synthetic resin, a nut 2 made of a synthetic resin fitted therewith and a member 3 to be fixed. The nut 2 has a double cylindrical boss portion 7 having a thread fitting portion 5 at the center, as in the embodiment 1 as described above, and a groove 6 is provided between the boss portion and the nut body. Figure 3(B) shows details of the anchor-type nut, in which the end face 8 of the double cylindrical

boss portion 7 and the end face 8' of the nut body are constituted so that the relationship therebetween may be  $L_2 > L_1$ , as in the case of the embodiment 1 as described above. With such a screw constitution, entirely the same effect of looseness prevention is produced as in the case of the screw of the embodiment 1.

In the case of an anchor screw, there may not be a member 3 to be fixed. In this case, for further promoting the effect of looseness prevention, a convex portion 9 is provided at the most remote portion of the nut and a cutting 10 is provided at the tip end of the bolt 1 so as to come into contact with the above convex portion 10, whereby a further looseness prevention effect can be exhibited through the resilience possessed by the synthetic resin.

On the other hand, when there is no member 3 to be fixed, instead of providing the difference between the end faces 8 and 8', a convex portion can be provided at the boundary 11 between the flange and the threaded portion of the bolt 1 so that the convex portion may press on the double cylindrical boss 7.

When employing synthetic resins for both the bolt 1 and the nut 2, first, the material of the bolt 1 desirably should be one which is relatively rigid and is little deformed by pressure, while the material of the nut 2, which has a relatively enriched resilience, has the property of being deformable by pressure and returning quickly again to the original form after removal of the pressure. For example, by using the same resin, the bolt 1 can be made of a resin reinforced with carbon fibers or glass fibers, and the nut 2 made of a non-reinforced resin.

Although the above preferred embodiments of the present invention are described with reference to Figs. 2 (A) and (B) and Figs. 3 (A) and (B), the scope of the present invention is, of course, not intended to be limited to these embodiments.

CLAIMS

1. A screw equipped with locking means, comprising a female thread made of a synthetic resin and a male thread made of a metal, or a female thread made of a synthetic resin and a male thread made of a synthetic resin, fitted with each other, said female thread having a double cylindrical boss portion formed at the center thereof so that the male thread may be fitted into the innerside boss portion and the thread portion of the boss may be deformed more or less when pressed against the shaft of said male thread in the direction perpendicular thereto through the resilience of the synthetic resin, which is the material of the female thread, by pressing the terminal end of said innerside boss portion against the flange portion of the male thread or a member to be fixed at the final stage of clamping the screw.

(to be replaced)

CLAIMS

1. (deleted)
2. (added) A screw equipped with locking means, comprising a female thread made of a synthetic resin provided with a convex portion at the bottom of the fitting portion and a male screw made of a synthetic resin or a metal having a cutting portion at the tip end of the thread portion, which is prevented from looseness in fitting the female thread made of a synthetic resin with the male thread made of a metal thread or the female thread made of a synthetic resin with the male thread made of a synthetic resin by deforming the convex portion at the bottom of the fitting portion of the female thread by pressure from the cutting portion at the tip end of the male thread at the final stage of clamping of the screw.
3. (added) A screw equipped with locking means according to Claim 2, wherein a double cylindrical boss portion is formed so that said male thread may be fitted with the innerside boss portion and the thread portion of the boss may be deformed more or less to be pressed against the shaft of said male thread in the direction perpendicular thereto through the resilience of the synthetic resin which is the material of the female thread by pressing the terminal end of said innerside boss portion against the flange portion of the male thread or a member to be fixed at the final stage of clamping the screw.

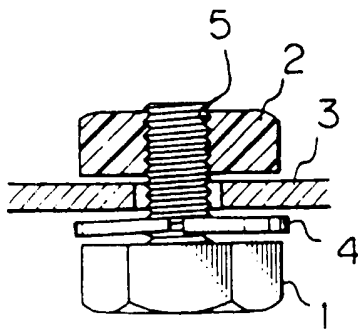
Description based on the provision under  
Article 19 (1) of PCT

The claims in the replaced sheet are related to the claim originally submitted as follows:

- (1) Claim 1 has been deleted.
- (2) Claims 2 and 3 are newly added.



*Fig. 1A*



*Fig. 1B*

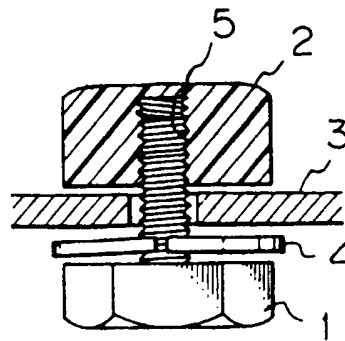
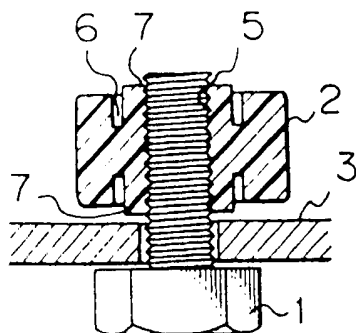
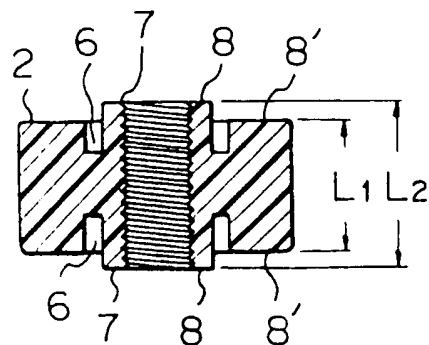
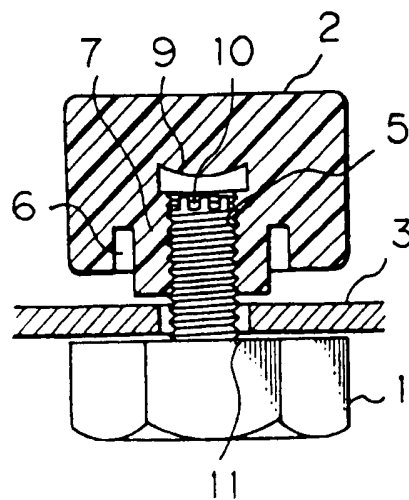
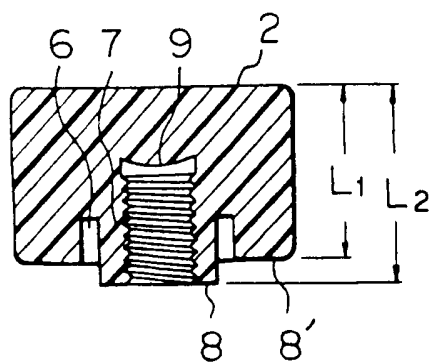


Fig. 2A



*Fig. 2 B*



*Fig. 3 A**Fig. 3B*

List of Reference Numerals

- 1: Bolt
- 2: Nut
- 3: Member to be fixed
- 4: Spring washer
- 5: Thread fitting portion
- 6: Groove
- 7: Double cylindrical boss
- 8: End face of double cylindrical boss
- 8': End face of nut body
- 9: Convex portion most remote in nut
- 10: Cutting at tip end of bolt
- 11: Boundary between threaded portion and flange portion of bolt

## INTERNATIONAL SEARCH REPORT

0223856

International Application No.

PCT/JP85/00618

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>1</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl <sup>4</sup> F16B39/28, F16B37/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>2</sup>		
Classification System	Classification Symbols	
IPC	F16B37/00, 39/22, 39/28, 39/282, 39/284	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched <sup>3</sup>		
Jitsuyo Shinan Koho	1926 - 1985	
Kokai Jitsuyo Shinan Koho	1971 - 1985	
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>1*</sup>		
Category <sup>1</sup>	Citation of Document, <sup>1*</sup> with indication, where appropriate, of the relevant passages <sup>1*</sup>	Relevant to Claim No. <sup>1*</sup>
Y	US, A, 3,030,997 (Prestole Co.) 24 April 1962 (24. 04. 62) Column 2, lines 33 to 54	1
Y	JP, U, 52-131564 (Toyota Motor Co., Ltd.) 6 October 1977 (06. 10. 77), Figs. 1 to 4 (Family: none)	1
Y	JP, U, 52-1959 (Matsuo Keiichi) 8 January 1977 (08. 01. 77), Figs. 1 to 2 (Family: none)	1
<p><sup>1*</sup> Special categories of cited documents: <sup>1*</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"G" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>1</sup>	Date of Mailing of this International Search Report <sup>1</sup>	
January 31, 1986 (31. 01. 86)	February 10, 1986 (10. 02. 86)	
International Searching Authority <sup>1</sup>	Signature of Authorized Officer <sup>1*</sup>	
Japanese Patent Office		